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ASSESSMENT OF GENETIC VARIABILITY OF SOME NEWLY DEVELOPED WHITERUST RESISTANT LINES OF INDIAN MUSTARD (B.JUNCEA L.)

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ABSTRACT

108 white rust resistant lines of Brassica juncea derived from Brassica napus and Brassica carinata evaluated with three checks viz. NRCDR02, Rohini, and NRCHB101 for 19 characters through PCV, GCV, heritability, correlation and path analysis. Length of secondary branch had highest PCV and GCV followed by number of secondary branch, number of pod on secondary branch. Number of secondary branch showed highest heritability followed by plant height and first effective branch. Number of secondary branch showed highest GAM followed by length of secondary branch. Plant height, number of primary and secondary branches per plant, length of main shoot, primary branches and secondary branches, number of siliqua on main shoot, primary branch and secondary branch, number of seed per pod, 1000-seed weight, biological yield per plant, harvest index and days to maturity presented positive and significant correlation with seed yield per plant at both phenotypic and genotypic level. Path analysis revealed that number of seed per siliqua had highest positive direct effect onseed yield per plant followed by siliqua on main shoot, siliqua on primary branch, siliqua on secondary branch, pod angle and 1000-seed weight also had positive direct effect on seed yield per plant.

KEYWORDS: *Brassica Juncea, Siliqua, Primary branches and Secondary Branches*

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INTRODUCTION

India is one of the largest rapeseed-mustard growing countries in the world, occupying the first position in Area and second position in Production after China. There are much of need diversity present in germplasm of Indian mustard for different yield and yield contributing traits but there is no diversity present for disease resistant in Indian mustard. A crop is faced many biotic and abiotic stresses in its season duration. All of them, one of the biotic stress is White rust caused by *Albugo candida* reduces the yield up to 60 % in the favorable and late sown condition. All the released high yielding varieties are succeptible to white rust. Hence, the present investigation is carried out to assess the nature and magnitude of genetic variability, their inter-relationships and contribution towards seed yield to generate high yielding recombinants with resistant for the development of high yielding cultivar in Indian mustard adapted to late sown condition for the benefit of farmers.

MATERIAL AND METHOD

Experimental material comprised of 108 white rust resistant lines and three checks namely NRCDR02, Rohini and NRCHB101. All the lines showed in Augmented Block Design at Directorate of Rapeseed-mustard Research, Bharatpur

during Rabi season of 2010-11. Each line sowed ion five rows and row to row spacing is 30cm and plant to plant spacing is 10cm and all agronomic practices applied for the better performance. At the time of maturity randomly selected five plants from each line for recording of data. Data were recorded for 19 characters (Plant height, first effective branch, number of primary branch, number of secondary branch, length of main shoot, length of primary branch, length of secondary branch, siliqua on main shoot, siliqua on primary branch, siliqua on secondary branch, pod length, pod angle, number of seed per pod, 1000-seed weight, oil content, seed yield per plant, biological yield per plant, harvest index and days to maturity). These data were used for statistical analysis. Genotypic and phenotypic correlation coefficients were computed as suggested by Al-Jibouri*et al.* (1958) and path coefficient were worked out as Dewey and Lu (1957).

REULTS AND DISCUSSIONS

Analysis of variance revealed significant for most of the characters under study except number of primary branch, siliqua length, and number of seed per siliqua, 1000-seed weight, and biological yield per plant and harvest index indicating presence of wide spectrum variability (table 1). The view of the data in table 2 depicted, Estimates of Genotypic coefficient variation varied from oil content (1.42) to length of secondary branch and phenotypic coefficient variation showed similar trend for the respective traits. Maximum and minimum differences between GCV and PCV were observed for 1000-seed weight and plant height indicating the influence of environment for these characters, respectively. Heritability was maximum for plant height and length of secondary branch (0.97) followed by first effective branch and length of primary branch.GCV along with heritability estimate gave the precise picture of genetic gain to be exploited through selection as suggested by Burton (1952).High values of GCV coupled with heritability were observed for length of secondary branch and number of secondary branch suggesting that additive gene action might play major role in the expression these characters and selection would be rewarding in further improvement of these characters (Mahmood et al., 2003; Pant and Singh, 2001; Khulbe et al., 2000; Shalini et al., 2000 and Ghosh and Ghulati, 2001). A parameter having high heritability and high genetic advance are considered under control of additive genes which highlighted the usefulness of selection based on phenotypic performance. (Goshak and Ghulati, 2001; Khulbe et al., 2000; Chaudhary et al., 1999 and kakroo et al, 2000) genetic advance as % of mean was maximum for number of secondary branch (44.09) followed by length of secondary branch (38.48), number of siliqua on secondary branch (33.45), seed yield per plant (27.10).While a parameter having high h^2 but low G.A. is considered under control non-additive genes. High values genetic advance for number of secondary branch (44.90) and length of secondary branch (38.48) depicted that mass selection based on these parameters could be useful in improving the seed yield from 38.48 to 44.90.

Correlation coefficient analysis (table 3) revealed that number of siliqua on primary branch had strong positive correlation with seed yield (0.59) followed by number of siliqua on main shoot (0.55), 1000-seed weight (0.56), length of primary branch (0.48), length of secondary branch (0.46), number of siliqua on secondary branch (0.45), plant height (0.40), number of seed per siliqua, biological yield per plant (0.38), length of main shoot (0.37), number of secondary branch (0.26), days to maturity (0.22), harvest index (0.20) and number of primary branch (0.18) (Bikram singh, 2004, Sirohi et al., 2004, Sudan et al., 2004, Kardam and singh, 2005, Sharad and Basudeosingh, 2005 and Tusar et al., 2006). Similarly siliqua length (0.15) and oil content (0.00) showed positive and non-significant correlation with seed yield per plant and first effective branch (-0.11) and siliqua angle (-0.01) showed negative and non-significant correlation with seed yield.

CONCLUSIONS

Path coefficient analysis (table 4) revealed that number of seed per siliqua had maximum direct effect (0.51) on seed yield. This is not supported by any other character through indirect effect. Character 1000-seed weight (0.45) was second best in its direct effect and this is not supported by any other characters. Trait siliqua on main shoot had positive direct effect (0.42) and also supported by siliqua on primary branch through indirectly. Character siliqua on primary branch had positive direct effect (0.27) this is supported by siliqua on main shoot. Siliqua on secondary branch had positive direct effect (0.16) on seed yield and this is supported by siliqua on main shoot and siliqua on primary branch. Character siliqua angle had direct effect (0.12) on seed yield and not supported by any other character. Character main shoot length, secondary branch length and biological yield per plant had negative direct effect on seed yield per plant but these characters showed positive correlation with seed yield per plant due to supported by other characters(poonam and Singh, 2004;, Kardam and Singh, 2005;, Bikram singh, 2004; and Tusar et al., 2005;). First effective branch and days to maturity had negative direct effect on seed yield. Plant height, number of primary branch, number of secondary branch length of primary branch, length of secondary branch directly increase the seed yield in Indian mustard. A parameter which had high range of genetic variability, high heritability, high genetic advance, highest degree of positive and significant correlation coefficient and highest direct effect on seed yield would be very effective and excellent tool for improving seed yield potential. Such a parameter in this study was number of siliqua on secondary branch which could raise the seed yield potential up to 33.45 % followed by length of secondary branch. It is concluded that selection of plants on the basis of number of siliqua on secondary branch and length of secondary branch would raise the potential of seed yield from 1.24 to 44.90 %.

REFERENCES

1. *Dewy, D.R. and K.H. Lu, 1959. A correlation and path coefficient analysis of component of crested wheat grass seed production. Agron. J., 51: 515-518.*
2. *Chaudhary, A.D., P.K. Barua and P.K. Duara, 1999.Siliquas traits for determining seed yield in Indian rapeseed. J. Agric. Sci. Society North East India, 12: 60-63.*
3. *Ghosh, S.K. and S.c. Gulati, 2001.Genetic variability and association of yield components in Indian mustard (B.junceaL). Crop Res. Hisar, 21: 345-349.*
4. *Kakroo, S.K., L.N. jindla and D.R. Satija, 2000. Genetic determination of seed yield through its components in Indian mustard (B.juncea L.). Crop Improvement, 27: 247-249.*
5. *Khulbe R.K., D.P. Pant and Naveen Saxena, 2000. Variability, heritability and genetic advance in Indian mustard (B.juncea L.). Crop. Res. Hisar, 20: 551-552.*
6. *Mahmood, T.,M. Ali, S.iqbal and M.Anwar, 2003. Genetic variability and hweritabilityestimaters in summer mustard (B.juncea L). Asian J. PL. sci., 2: 77-79*
7. *Pant, S.C. and P.Singh, 2001. Genetic variability in Indian mustard. Agric. Sci. Digest, 21: 2-30.*
8. *Shalini, T.S., R.A. Sheriff, R.S. Kulkarni and p. Venkataraimana, 2000.Variability studies in Indian mustard (B.juncea L). Res.On Crops, 1: 230-234.*
9. *Sudan, R.S., Singh, S.P. and Kashyap, S.C., 2004, Path analysis of yield and its components in Indian mustard (Brassica juncea (L.) Czern and Coss). Ann. Agric. Bio. Res.,9(2): 119-122.*

10. Tusar, P., Maiti, S. and Mitra, B., 2006, Variability, correlation and path analysis of the yield attributing characters of mustard (Brassica sp.). Res. Crops, 7(1): 191-193.

11. Poonam, S. and Singh, D.N., 2004, Path coefficient analysis in Indian mustard (Brassicajuncea L.). J. Res., Bisra Agric. Univ., Ranchi, 16(2): 293-295.

12. Sharad, P. and Basudeo Singh, 2005, Inter character association and path analysis in Indian mustard (Brassica juncea L.). Adv. Pl. Sci., 18(2): 511-514.

13. Bikram Singh, 2004, Character association and path analysis under dryland condition in India mustard (B. juncea). Cruciferae Newslet., **25**: 99-100.

14. Kardam, D.K. and Singh, V.V., 2005, Correlation and path analysis in Indian mustard (Brassica juncea(L.) Czern and Coss) grown under rainfed condition. J. Spices Arom. Crops, 14(1): 56-60.

APPENDICES

Table 1: Analysis of Variance for 19 Yield and Yield Component Traits of White Rust Resistant Line in (B.Juncea) Indian Mustard

source of variation	DF	1 plant height	2First effective branch	3number of primary branch	4number of secondary branch	5length of main shoot	6length of primary branch	7length of secondary branch	8numbr of pod on main shoot	9numbr of pod on primary branch	10number of pod on secondary branch	11pod length	12pod angle	13number of seed pr pod	14test weight	15oil content	16seed yield per plant	17Biological yield per plant	18harvest index	19Days to maturity
Among entries	110	297.45**	249.21**	1.22	9.01**	49.78**	36.19**	90.00**	43.75**	30.62**	16.31**	0.31	13.94*	2.32	0.39	0.14**	1.43*	1.27	48.53	11.05**
Among checks	[illegible]	528.96	1042.05**	22.03**	164.18**	149.59**	63.69**	18.45**	621.76**	505.22**	210.95**	5.15**	11.54	19.02**	2.90*	1.13**	24.22**	45.37**	146.27*	11.10**
Among varieties	107	233.33**	236.77**	0.79	4.1**	47.91**	34.37**	67.33**	31.85**	20.31**	11.11**	0.16	13.00*	1.74	0.29	0.32**	0.96*	0.87	44.69	11.96**
Checks v/s varieties	1	6695.61**	0.01	6.13**	223.66**	49.72*	176.00**	4.20	161.02**	184.92**	181.95**	7.55**	119.58**	30.34**	6.76**	0.89**	5.63**	65.75**	63.99	23.78**
Error	15	6.58	9.64	0.49	0.99	10.40	3.30	2.47	6.94	4.96	2.62	0.46	4.34	1.72	0.60	0.06	0.38	1.09	31.58	1.66
Genotypic variance	V_g	290.9	240	0.73	8.02	39.4	32.9	87.5	36.8	25.7	13.7	-0.1	9.61	0.6	-0.2	0.28	1.05	0.18	16.9	10.4
Phenotypic variance	V_p	297.5	249	1.23	9.01	49.8	36.2	90	43.8	30.6	16.3	0.31	13.9	2.32	0.4	0.34	1.43	1.27	48.5	12.1
Error variance	V_e	6.577	9.64	0.49	0.99	10.4	3.3	2.47	6.94	4.96	2.62	0.46	4.34	1.72	0.6	0.06	0.38	1.09	31.6	1.66

Table 2: Mean, Range of Phenotypic Variability, GCV, PCV, Heritability, Genetic Advance and Genetic Advance As % of Mean in White Rust Resistant Lines of B.Juncea

Character	MEAN	Range	PCV	GCV	h^2	GA	GAM
1 plant height	204.27	168.8 - 264.7	8.54	8.44	97.789	34.74	17.008
2First effective branch	68.11	28.5 -105	23.62	23.18	96.13104	31.26	11.442
3number of primary branch	5.42	3.25 - 8.55	24.19	20.44	59.8479	1.36	22.007
4number of secondary branch	6.89	2.6 - 17	45.86	43.54	89.03921	5.51	44.909
5length of main shoot	67.83	46.8 - 85	11.44	10.40	79.10112	11.50	6.085
6length of primary branch	46.29	33.4 -64	13.58	13.00	90.87623	11.26	9.704
7length of secondary branch	15.93	5.7 - 31.13	60.38	59.57	97.25783	19.01	38.489
8numbr of pod on main shoot	43.12	31 - 56.8	16.51	15.34	84.13437	11.46	9.964
9numbr of pod on primary branch	29.89	17.8 - 43.75	19.96	18.52	83.81696	9.56	13.090
10number of pod on secondary branch	10.01	3.7 - 24.25	43.48	40.36	83.93398	6.98	33.454
11pod length	3.68	2.94 - 4.75	24.00	15.27	-47.223	-0.55	-15.809
12pod angle	24.03	15 - 33.5	17.79	15.54	68.91443	5.30	10.670
13number of seed pr pod	13.48	10 - 24.8	14.91	11.30	25.96093	0.82	4.263

Table 2 Contd.,

14test weight	4.66	3.6 - 5.7	21.41	13.55	-49.65007	-0.65	-13.875
15oil content	41.20	39.34 - 42.3	1.54	1.42	82.61722	1.00	3.041
16seed yield per plant	5.73	2.33 - 6.55	23.52	20.88	73.16295	1.80	27.109
17Biological yield per plant	13.57	10.8 - 20.05	15.39	11.10	7.870835	0.24	1.246
18harvest index	42.22	19.4 - 47.35	21.20	16.50	34.92182	5.01	3.97
19Days to maturity	137.45	128 - 146	2.69	2.53	86.24493	6.17	2.33

Table 3: Genotypic Correlation between Yield and Yield Component Traits in Indian Mustard (Brassica Juncea)

Characters	1 plant height	2First effective branch	3number of primary branch	4number of secondary branch	5length of main shoot	6length of primary branch	7length of secondarybranch	8numbr of pod on main shoot	9numbr of pod on primary branch	10number of pod on secondary branch	11pod length	12pod angle	13number of seed per pod	14test weight	15oil content	16seed yield per plant	17Biological yield per plant	18harvest index	19Days to maturity
1	1																		
2	0.33**	1																	
3	0.46**	-0.07	1																
4	0.17*	-0.23**	0.45**	1.00															
5	0.28**	-0.30**	-0.05	0.11	1.00														
6	0.45**	-0.28**	0.11**	0.14	0.62**	1.00													
7	0.40**	-0.38**	0.36**	0.10	0.47**	0.66**	1.00												
8	0.36**	-0.13	0.15	0.19	0.76**	0.52**	0.39**	1.00											
9	0.42**	-0.17*	0.29**	0.29	0.55**	0.73**	0.51**	0.81**	1.00										
10	0.37**	-0.33**	0.27**	0.16	0.42**	0.62**	0.66**	0.40**	0.56**	1.00									
11	0.10	-0.01	0.12	-0.01	0.11	0.00	0.09	0.11	0.04	0.07	1.00								
12	-0.06	0.20*	0.04	0.22**	-0.11	-0.25**	-0.08	-0.09	-0.12	-0.12	0.24**	1.00							
13	0.07	0.00	0.02	0.08	-0.09	0.00	0.12	-0.25**	-0.16	-0.26**	0.32**	0.01	1.00						
14	0.13	0.04	0.03	0.05	0.00	0.11	0.09	0.08	0.03	0.08	-0.01	-0.09	0.09	1.00					
15	-0.02	-0.08	0.00	-0.03	0.02	0.04	-0.01	-0.08	0.00	-0.02	-0.20*	-0.35**	0.01	-0.03	1.00				
16	0.40**	-0.11	0.18*	0.26**	0.37**	0.48**	0.46**	0.55**	0.59**	0.45**	0.15	-0.01	0.40**	0.56**	0.00	1.00			
17	0.27**	-0.05	0.16*	0.17*	0.14	0.14	0.28**	0.26**	0.30**	0.22**	0.09	0.07	0.16	0.26**	-0.09	0.38**	1.00		
18	0.32**	-0.10	0.11	0.20*	0.35**	0.47**	0.38**	0.48**	0.50**	0.39**	0.12	-0.05	0.36**	0.49**	0.03	0.20**	-0.01	1.00	
19	0.10	0.09	-0.01	-0.09	-0.07	-0.10	-0.20	-0.09	-0.15	-0.18*	0.05	-0.09	0.09	-0.07	-0.05	-0.10	-0.16*	-0.03	1.00

Table 4: Path Coefficient Analysis for 18 Characters Towards Seed Yield Per Plant in B.Juncea

Characters	Plant height	First effective	Number of primary branch	Number of secondary branch	Mainshoot length	Primary branch length	Secondary branch length	Siliqua on MS	Siliqua on PB	f siliqua on Secondary Branch	Siliqua length	Siliqua angle	Number of seed per siliqua	1000-seed weight	Oil content	Biological yield per plant	Harvest index	DM
1	**0.098**	0.022	0.039	0.002	-0.027	0.013	-0.0250	0.1476	0.1114	0.0564	-0.0045	-0.0099	0.0394	0.0630	-0.0006	-0.0177	-0.0163	-0.0007
2	0.032	**-0.069**	0.005	-0.004	0.030	-0.007	0.0230	-0.0436	-0.0438	-0.0499	-0.0001	0.0242	0.0098	0.0245	-0.0038	0.0018	0.0040	-0.0008
3	0.046	0.004	**0.083**	0.010	0.003	0.007	-0.0244	0.0828	0.0882	0.0508	-0.0047	0.0016	0.0262	0.0160	0.0001	-0.0119	0.0011	0.0001
4	0.012	0.012	0.038	**0.023**	-0.015	0.003	-0.0235	0.1102	0.0912	0.0421	0.0003	0.0239	0.0651	0.0258	-0.0013	-0.0120	0.0295	0.0005
5	0.026	0.020	0.002	0.003	**-0.105**	0.017	-0.0308	0.2808	0.1526	0.0744	-0.0044	-0.0150	-0.0347	0.0033	0.0010	-0.0095	0.0084	0.0005
6	0.046	0.019	0.021	0.002	-0.064	**0.028**	-0.0418	0.2184	0.1613	0.1002	-0.0003	-0.0326	0.0035	0.0544	0.0028	-0.0096	-0.0105	0.0010
7	0.038	0.024	0.031	0.008	-0.050	0.018	**-0.0639**	0.1804	0.1436	0.1327	-0.0037	-0.0114	0.0728	0.0424	-0.0003	-0.0181	0.0089	0.0016
8	0.033	0.007	0.016	0.006	-0.068	0.014	-0.0269	**0.4287**	0.2227	0.0745	-0.0038	-0.0129	-0.1028	0.0418	-0.0035	-0.0175	0.0113	0.0007
9	0.040	0.011	0.027	0.007	-0.059	0.017	-0.0339	0.3527	**0.2708**	0.0975	-0.0014	-0.0135	-0.0631	0.0145	-0.0001	-0.0197	0.0084	0.0012
10	0.033	0.020	-0.025	0.005	-0.046	0.017	-0.050	0.1898	0.1570	**0.1682**	-0.0028	-0.0160	0.0071	0.0413	-0.0009	-0.0147	0.0182	0.0013
11	0.011	-0.000	-0.010	-0.000	-0.011	0.000	-.0061	0.0419	0.0096	0.0122	**-0.0387**	0.0297	0.1693	-0.0279	-0.0103	-0.0062	-0.0030	-0.0004
12	-0.007	-0.013	-0.001	0.004	0.012	-0.007	0.0058	-0.0439	-0.0289	-0.0213	-0.0091	**0.1264**	0.0011	-0.0436	-0.0071	-0.0034	0.0014	0.0007
13	0.007	-0.001	-0.004	0.003	0.007	0.000	-.0091	-0.0863	-0.0335	0.0024	-0.0128	0.0003	**0.5102**	0.0461	0.0009	-0.0115	0.0060	-0.0008
14	0.013	-0.003	-0.002	0.001	-0.000	0.003	-.0060	0.0396	0.0087	0.0153	0.0024	-0.0122	0.0519	**0.4531**	-0.0010	-0.0173	-0.0009	0.0006
15	-.001	0.004	-0.000	-0.000	-0.001	0.001	0.0004	-0.0279	-0.0005	-0.0028	0.0073	-0.0165	0.0082	-.0083	**0.0546**	0.0045	-0.0030	0.0004
16	0.028	0.002	-0.016	0.004	-0.016	0.004	-.0190	0.1231	0.0875	0.0406	-0.0040	0.0070	0.0963	0.185	-.0040	**-0.0608**	-0.0014	0.0014
17	-.017	0.003	-0.001	0.007	-0.009	-0.003	-.0063	0.0530	0.0249	0.0336	0.0013	0.0019	0.0338	-0.0044	-0.0018	0.0009	**0.0911**	-0.0006
18	0.008	-0.007	0.001	-0.001	0.006	-0.003	0.0126	-0.0353	-0.0393	-0.0274	-0.0021	-0.0114	0.0479	-0.0314	-0.0026	0.0100	0.0070	**-0.0083**